A LIGHT-WEIGHT MALAISE TRAP[1]

Henry Townes[2]

In 1962 I published plans for making a Malaise trap for catching flying insects (Proc. Ent. Soc. Washington 64: 253-262). Judging by demands for reprints of the article, this design has been used all over the world, though I suspect that most of those using the reprint diverged from the published design to some degree.

There is no doubt that this trap catches insects very well, but it is difficult to make, and if made of the materials specified it weights 13½ pounds. The disadvantage of weight became apparent when I started shipping such traps by air mail to colleagues wanting to use it in foreign countries.

In the summer of 1965 I worked on a pattern that would be lighter in weight and easier to make. This design was tested against the design of 1962, and with progressive modifications became equally efficient at catching insects. Since 1965, about sixty traps of the new model have been made, and used in diverse collecting situations. This design also has been copied by entomologists who have seen examples of it, but the copies have sometimes neglected certain features that are important for an efficient trap.

Although almost any Malaise trap will catch an astonishing number of insects, there is much difference between a good design and a poor one. A poorly designed trap may catch only a tenth of the catch of a better one of the same size, but its inferiority may be unsuspected until it is directly compared with the better trap.

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[2]American Entomological Institute, 5950 Warren Road, Ann Arbor, Mich. 48105

My lighter weight design is described below. It weights 1.2 pounds (without the jar for alcohol). Many variations of this pattern can be used, but one should not believe that innovations will be better, or even equal, until they are proven in field tests. As examples, sagging of the top of the trap lessens the catch, and the exact shape given for the top pieces of the trap is meant to minimize sagging. The color of the trap is important. I spent two months of one summer experimenting with the colors of various parts. The clack colored parts, as recommended, increase the catch 70% (in shade) to 180% (in sunlight), over the catch of an entirely white trap that is otherwise identical. There could be further improvements in the color pattern, but unless one has the time to test his experimental colors, it would be advisable to use the colors recommended.

Below is a list of materials for one trap of the light weight design, followed by descriptions and illustrations of trap parts, and directions for assembly.

List of materials

Dacron marquisette, 44 inches wide (or 41 to 46 inches wide), 25 meshes per inch; 36 feet. (Dacron is called Terylene in Great Britain.) Cotton marquisette netting can be used but this is prone to rot in wet weather. Do not use nylon, as nylon is rotted by sunlight.

Cotton twill tape, 1/2 inch wide: 98 feet. Preshrink this before use by soaking in hot water and drying without stretching. Wind it on a piece of cardboard, without stretching.

Thread (preferably Dacron but cotton acceptable), 40 or 50 gauge: 200 yards.

Cotton twine: about 40 feet.

Plastic jar (non-linear polypropylene or non-linear polyethylene) of a mason jar design: 1 pint size, with screw cap of the *same* kind of plastic. The jar diameter is 3¼ inches, height 5¼ inches, and mouth opening 2⅜ inches. Some other plastic jar of about the same size can be substituted.

Aluminum stock, 1/8 inch thick, size 3¼x7 inches.

Aluminum stock, 1/16 inch thick, size 3¼x3¼ inches. Heavy galvanized iron (3¼x3¼ inches) can be substituted.

4 machine bolts, brass, flat headed, 1/8 inch diameter, 3/8 inch long, with nuts.

4 machine bolts, brass, round headed, 1/8 inch diameter, 1/2 inch long, with nuts.

1 spray can of flat black paint, 12 ounces content.

Rubber cement or contact cement.

Total cost of materials is $9.00 to $20.00, depending on the retailer's profit.

Tools needed: Scissors, sewing machine, about 100 straight pins, saber saw or scroll saw with blade for aluminum cutting, bench vise, drill with 1/8 inch twist bit, and another twist bit of 5/16 to 1/2 inch diameter (for countersinking), nail or scribe with sharpened point, pocket knife, hammer, large

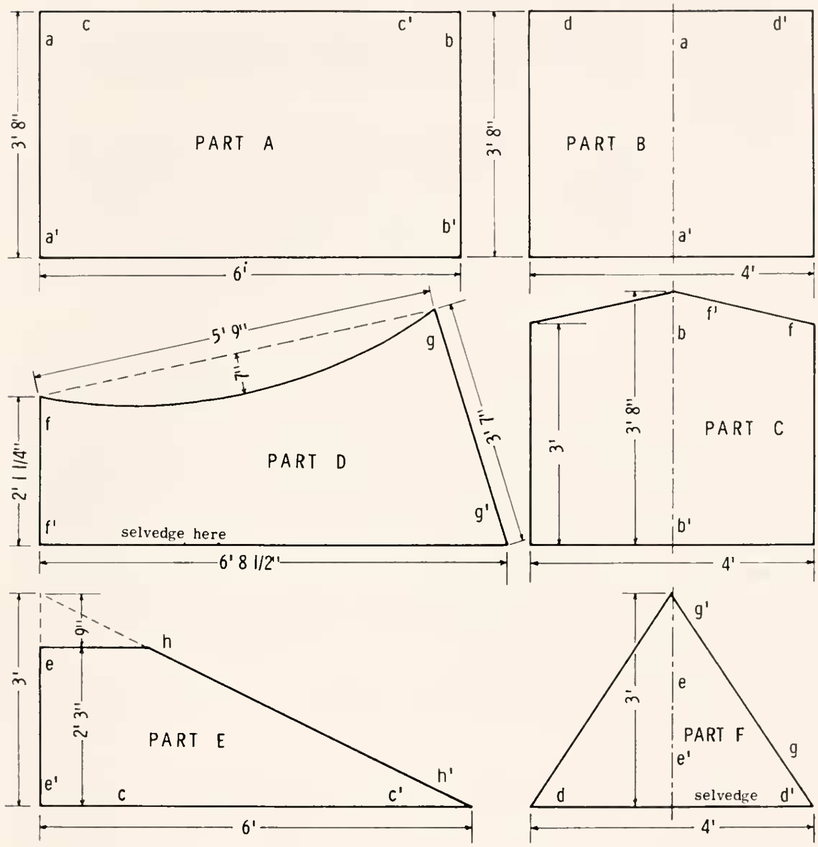

Figure 1. Patterns for the fabric parts of a Malaise trap.

skillet or a suitable substitute, and length of 3 inch pipe (at least 4 inches long).

List of Fabric Parts

A. Center baffle, lower part (figure 1, A). Dacron marquisette, 6 feet long, 44 inches wide. Sew twill tape on all edges, double stitched.

B. Front baffle (figure 1, B). Dacron marquisette, 4 feet long, 44 inches wide. Sew twill tape on all edges, double stitched.

C. Back baffle (figure 1, C). Dacron marquisette, 4 feet long, 44 inches wide, the top obliquely cut away on each side as in the drawing. Pin twill tape along the oblique cuts before the cuts are made. Sew twill tape on all edges, double stitched.

D. Roof panel (figure 1, D); make two. Dacron marquisette, cut as in figure. Selvedge must be along the long side. Pin twill tape to the oblique side and the concave side before these cuts are made. Sew twill tape on all edges, double stitched.
E. Center baffle, upper part (figure 1, E). Dacron marquisette cut as in the figure. Sew twill tape to all edges but the oblique edge, double stitched.
F. Front of roof (figure 1, F). Dacron marquisette, cut as in the figure. Selvedge must be along the 4 foot side. Pin twill tape to the two sloping sides before these cuts are made. Sew twill tape on all edges, double stitched.
J. Tie loops; make 14. Cut 1/2 inch twill tape into 6 inch lengths.

Assembly of Fabric Parts

Before assembly, parts A, B, C, and E are colored black. This is essential for an efficient trap. The parts are laid on the ground, piled or folded (or both) so that they are 4 thicknesses deep, then sprayed with black paint from an atomizing spray can. The 4 thicknesses are to catch and save paint that penetrates the upper layers. When the spray turns the top layer black, turn the pile over and spray the whitish or gray areas until they are black also. Finally split the pile open and spray black any areas that are still grayish. Dacron can not be dyed, hence to make it black it must be sprayed with paint. The finding that the black could be sprayed on was by Dr. R. W. Carlson. This may seem a small matter, but for Malaise trap construction it was a major discovery.

After spraying with black, sew the edges aa of part A to the center line of part B, then sew the edge bb of part A to the center line of part C, then sew the edge cc of part A to edge cc of part E, then sew the edge dd of part F to edge dd of part B, then sew the edge ee of part E to the center line of part F, then sew edge ff of part D to edge ff of part C, then sew edge gg of part D to edge gg of part F. There are two of part D, one for each side of the trap roof. One of these roof parts has been sewed on. Now sew the other roof part to the opposite upper edges of parts C and F. Make sure that all corners are firmly stitched.

The trap fabric is now assembled except that the center line of the roof, joining the two parts D to part E, is not sewn together. To get this seam properly done, the trap must be set up and the parts pinned into place before sewing. Before setting up the trap, the tie loops must be attached. There are 14 tie loops, each made of a six inch piece of 1/2 inch twill tape. Double each piece to a loop and sew in place, very firmly stitched. One loop goes at each of the four corners of parts B and C, one at the top center line and bottom center line of both parts B and C, and two are spaced along the bottom edge of part A.

For setting up the trap, get 5 sticks, each 4½ feet long, and one stick 8 feet long. Sharpen one end of each of the sticks. Using four of the shorter sticks, push them into soft earth to make a rectangle 4½ feet wide and 6½ feet long. Put the trap into the rectangle and with short lengths of cotton twine tie the bottom corner loops to the 4 sticks at ground level. Tie the top loops to near the top of each stick. Guy the sticks out with cord leading to short stakes in the ground. Adjust the ties until the fabric of the black parts (parts A, B, and C) is stretched smooth and tight. Plant the fifth short stick at the center line of part C, tie part C to this stick top and botton, and guy the stick with a cord. Now plant the 8 foot stick at the center line of part B. Tie part B top and bottom to this stick. Guy it with a cord to stretch the trap tight, then take the peak of the roof (top of part F) and tie it near top of the 8 foot stick. Readjust the tying and guy cords until the entire trap is tight and smooth.

After the trap is set up, as directed above, draw edge hh of part E between the center edges of the two sides of the roof (parts D). Pull part E smooth and pin it between the edges of parts D. Take the trap down and sew the median edges of parts D together, including between them the upper edge of part E. Trim off the protruding excess of part E and the fabric part of the trap is complete.

List of Non-fabric Parts

G. Aluminum, 1/8 inch thick, size 3¼x7 inches. Cut as in figure 2, G. Use a scroll saw or saber saw for cutting. The center circle can be cut out with a circle cutter. Drill 8 holes, 1/8 inch diameter, as shown. Countersink 4 of the holes, as shown, with the tip of a drill bit, deep enough to receive the head of a 1/8 inch flat-head bolt. Bend the top part of the piece to a concavity that fits the convexity of the plastic jar (part I). This is most easily done by hammering it into shape over a piece of 3 inch iron pipe. The countersunk holes must be on the concave side. Next bend the bottom portion of the piece into a ferrule, turning the edges up and together on the side opposite from the concavity of the top part. Bending into a ferrule is best done by hammering into shape over a iron bar or spike.

H. Aluminum, 1/16 inch thick, size 3¼x3¼ inches. Heavy galvanized iron can be substituted for aluminum. Cut into a circle and cut out the center as

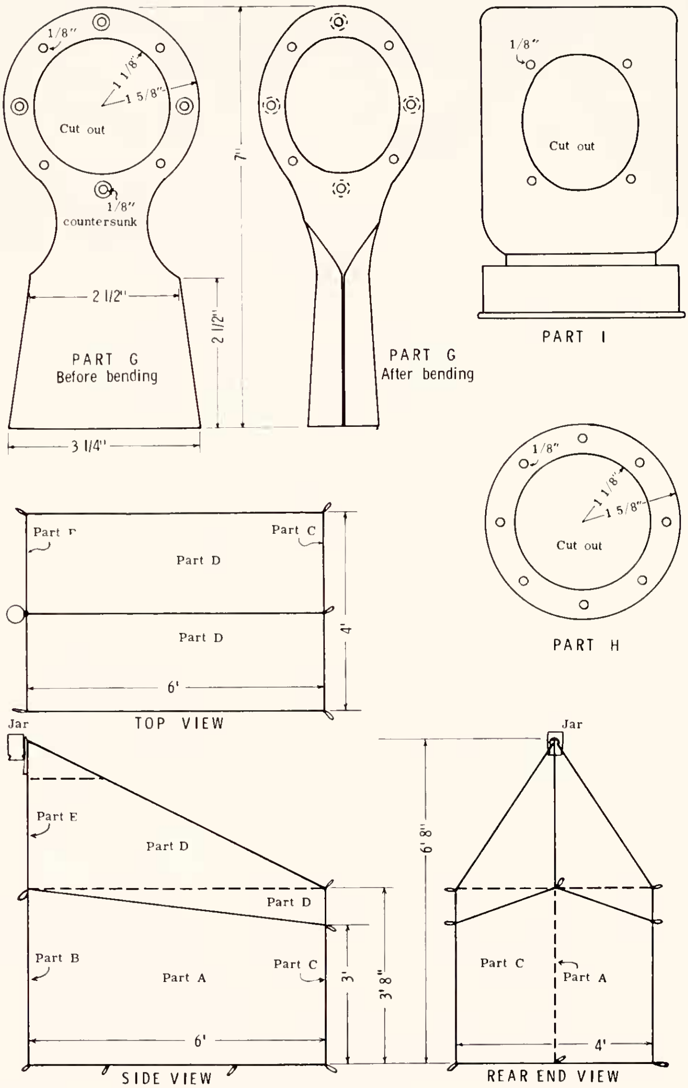

FIGURE 2. Patterns for the metal parts and modified plastic jar for a Malaise trap. Three views of the complete trap.

figured, using a scroll saw, saber saw, circle cutter, or tin snips. Bend the piece to a concavity that fits the convexity of the plastic jar (part I). This can be done by hammering it to fit a piece of 3 inch iron pipe. After it is bent, fit the circle over the circle in the upper part of part G and drill eight 1/8 inch holes to match those in part G, using part G as a template.

I. Plastic jar, mason jar style, pint size, with plastic screw cover. The jar and its screw cover must be non-linear polypropylene or polyethylene, with the jar and cover of the same material. Modify the jar as follows: Immerse the mouth of the jar to a depth of 1 or 2 inches in boiling water, to soften the plastic. With a pocket knife, cut off the male screw of the jar, at the shoulder. Take the jar cover and cut out a center hole 2⅛ inches in diameter. Put a large skillet or a piece of flat metal on an electric or gas burner, start the burner, and press both the open end of the jar and the top side of the cover to the skillet. As soon as the warming skillet melts the edges of the jar and its cover all the way around, take both off the skillet and quickly press their edges together. This cements the cover to the jar and converts the thread of the jar from male (cut away) to female (the cover as cemented on). Next fit the concave side of part G against the jar, with the ferrule pointed past the mouth of the jar. Center the hole in part G at the midlength of the jar. Using this as a template, drill 4 holes of 1/8 inch diameter through the wall of the jar opposite each of the *non*-countersunk holes in part G. Keeping part G opposite the drilled holes, mark the circumference of its center hole on the jar, using a scribe or sharpened nail. Take away part G and cut out the hole marked on the jar wall. See figure 2, I.

Attaching the Jar

The plastic jar is for a collecting chamber at the peak of the trap. Parts G and H are for attaching the jar to the trap. Attachment is in two stages: Attaching the trap to parts G and H; and attaching G and H to the jar.

To make a smooth attachment, the fabric of the trap must be stretched in its position of use. Do this by tying out the upper corners of the trap to full stretch, then pulling up the peak of the roof by hand. Hold up the peak while it is being attached to parts G and H. This will help get a smooth, wrinkle-free installation.

Hold part G so that the ferrule points downward. Put part H over the circular part of G so that the holes match. Mark the upper edge of H and when attaching it to the trap keep this edge upward.

With scissors slit the seams at the peak of the trap backward from the point about 2 inches. Hold part H vertically, with the convex side toward the trap and upper edge upward. Smear its concave side with rubber cement or with contact cement. Pull the points of the trap

FIGURE 3. The complete trap, as it is set up, and a close-up view of the collecting assembly at the peak of the trap. The trap is set up in the snow (not a good season for collecting), and the close-up view is backed with black cardboard for a contrasting background.

peak through the center hole of H, turn them outward and press them into the rubber cement. Make scissor cuts into the points of the trap as they are pulled through the hole of H so that the trap peak makes as smooth an entry as possible into this hole. Paste the cut ends back against the ring of part H to hold them in place. When a good fit is achieved, place the ring portion of part G over H and match up the holes. The ferrule of G should point downward. Bolt G and H together, using the 4 flat-headed machine bolts through the counter-sunk holes. This holds the points of the trap between parts G and H and leads the apex of the trap through their center hole. Now bolt G and H to the jar, the jar mouth pointing downward. Use the 4 round-headed machine bolts, through the 4 remaining holes.

The trap is ready to use. It is set up as directed for the final step of sewing the fabric parts. The 8 foot pole used at that time should have the top end sharpened to enter the ferrule of part G, and the pole should be shortened about 6 inches so that it doesn't hold the bottom edge of the trap off the ground. The two loops on the bottom edge of part A (the center baffle) are for staking this edge to the ground. Figure 3 shows the trap set up, and a close-up of the collecting assembly at the peak of the trap. When the trap is set up next to bushes, as is usually the case, some of the corners can be tied to the bushes instead of to stakes.

To run the trap, fill a pint mason jar half full of 95% ethyl alcohol (or isopropyl alcohol) and screw it into the bottom of the plastic jar. If the specimens are not wanted in alcohol, several other killing methods are available.

1. Use a cyanide jar instead of the alcohol jar.
2. Use a jar containing paper strips and a vial of fumigant (as ethyl acetate) dispensed with a wick through a hole in the cork.
3. Use a fumigating insecticide, as Vapona, hung in the plastic jar, with a receiving jar screwed in below. The receiving jar should contain paper strips to help protect delicate specimens.

The placing of the trap is very important. It should, of course, be where the desired insects are common, and in a flyway. Insect flyways are along paths, roads, or openings, along edges of woods, and in open country, around and between bushes. The back end of the trap should be backed up to the vegetation and the front end, with the jar, toward the open and toward the light. Moving the trap around will help in locating the best spots for trapping.